

NOVEMBER/DECEMBER 2023

23PECH14A — ELECTROCHEMISTRY

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.



1. Give arrhenius theory of electrolysis.
2. What is bjerrum model in electrochemistry?
3. What is meant by electrolyte interface?
4. Define zeta potential.
5. State Nernst equation.
6. What is net current density?
7. Write the significance of charge transfer coefficient.
8. Draw and delineate Evan's diagrams.
9. What are the modes of transport of electro active species?
10. Write the principle of voltammetry technique.

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL questions.

11. (a) Derive Debye-Huckel limiting law at appreciable concentration of electrolytes.

Or

- (b) How will you determine the activity coefficient by an electrochemical method?

12. (a) Describe the Helmholtz – Perrin model of electrical double layer.

Or

- (b) Derive Lippmann equation.

13. (a) Write note on polarizable and non-polarizable electrodes.

Or

- (b) Derive Butler-Volmer equation.

14. (a) Illustrate the mechanism involved in the oxygen evolution reaction.

Or

- (b) Give the electro-chemical reaction mechanism for the reduction of Fe^{2+} and dissolution of Fe to Fe^{2+} .

15. (a) Discuss the principle and application of square wave polarography.

Or

- (b) Explain the working principle of lithium-ion batteries.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Discuss the Debye-Huckel Onsager treatment of strong electrolyte. Give its qualitative and quantitative verification and limitations.

17. Discuss Guoy Chapman and Stern models of electrical double layer.

18. Write an account on symmetry factor and transfer coefficient Tafel equations and Tafel plots.

19. Derive Butler volmer equation for one step and multistep electron transfer reactions.

20. What are fuel cells and how are they classified? Describe the functioning of alkaline fuel cells and high temperature fuel cells.